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(71)Applicant : FUJI PHOTO FILM CO LTD  
SASAKI KAGAKU YAKUHIIN KK

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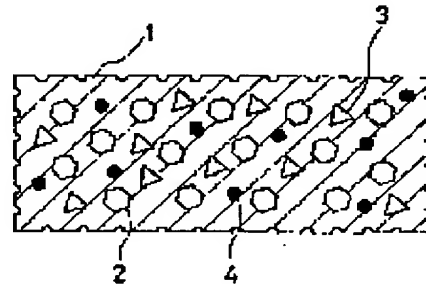
(72)Inventor : KISHIMOTO HISAO  
ISOJIMA EIJI

### (54) MOISTURE -CONDITIONING/GAS -ABSORBING MOLDING

#### (57)Abstract:

PURPOSE: To obtain a moisture-conducting/gas-absorbing molding made proof for a long time against deterioration due to moisture absorption or gas absorption by molding a mixture obtained by kneading a thermoplastic resin, magnesium sulfate as a moisture conditioner and a specified gas-absorbing composition.

CONSTITUTION: This moisture-conditioning/gas-absorbing molding is obtained by molding a mixture obtained by kneading a thermoplastic resin 1, humidity- conditioning magnesium sulfate 2 represented by the formula:  $MgSO_4 \cdot nH_2O$  (wherein  $0 \leq n \leq 3$ ) and having a mean particle diameter of  $1-30 \mu m$  and a gas- absorbing composition 3 containing MgO and  $Al_2O_3$ . This molding is made proof for a long time against deterioration and is capable of maintaining the quality and function stably and effectively. If a compound 4 having a function of an indicator which can indicate the degree of moisture absorption and the degree of gas absorption is added to the molding, the time when the molding needs to be changed can be indicated to make the more stable storage of the molding possible.



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(71) 出願人 000005201

富士写真フイルム株式会社  
神奈川県南足柄市中沼210番地

(71) 出願人 591192720

佐々木化学薬品株式会社  
京都府京都市山科区勧修寺西北出町10番地  
の1

(72) 発明者 岸本 尚男

神奈川県南足柄市中沼210番地 富士写真  
フイルム株式会社内

(72) 発明者 磯脇 英二

京都府京都市山科区勧修寺西北出町10番地  
佐々木化学薬品株式会社内

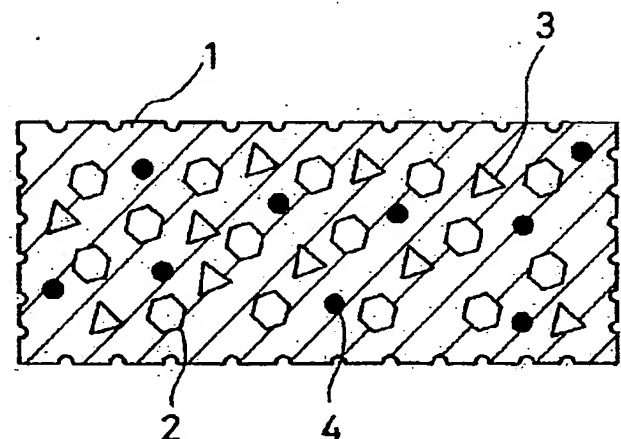
(74) 代理人 弁理士 萩野 平 (外3名)

(54) 【発明の名称】 調湿・吸ガス性成形品

(57) 【要約】

【目的】 保存における吸湿及び吸ガスによる各種製品の品質の劣化を長期にわたって防止することができ、更に該製品の品質、機能を安全且つ有効的に保存可能な調湿・吸ガス性成形品を提供する。

【構成】 熱可塑性樹脂を調湿剤（硫酸マグネシウム）とガス吸収剤とともに混練成形して得られる調湿・吸ガス性成形品。



## 【特許請求の範囲】

【請求項1】 熱可塑性樹脂を、調湿性の $\text{MgSO}_4 \cdot n\text{H}_2\text{O}$ （ただし $0 \leq n \leq 3$ ）で表され、平均粒子径が $1 \sim 30 \mu\text{m}$ である硫酸マグネシウムと、 $\text{MgO}$ 及び $\text{Al}_2\text{O}_3$ を含有した吸ガス性の組成物とともに混練成形して得られることを特徴とする調湿・吸ガス性成形品。

【請求項2】 熱可塑性樹脂を、調湿性の $\text{MgSO}_4 \cdot n\text{H}_2\text{O}$ （ただし $0 \leq n \leq 3$ ）で表され、平均粒子径が $1 \sim 30 \mu\text{m}$ である硫酸マグネシウムと、 $\text{MgO}$ 及び $\text{Al}_2\text{O}_3$ を含有した吸ガス性の組成物とともに混練成形して得られることを特徴とするポリマー支持体を基材とする記録材料の保存用調湿・吸ガス性成形品。

【請求項3】 酢酸ガスを吸収する能力を有することを特徴とする請求項1又は2に記載の調湿・吸ガス性成形品。

【請求項4】 吸湿度あるいは吸ガス度を示すインジケータ機能を有することを特徴とする請求項1又は2に記載の調湿・吸ガス性成形品。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】本発明は、調湿・吸ガス性成形品、特に吸湿及び吸ガスによる各種製品等の保存における品質の劣化を長期にわたって防止することができ、更に該製品の品質、機能を安全且つ有効的に保存可能な調湿・吸ガス性成形品に関する。

## 【0002】

【従来技術】従来、食品、医薬品、電子部品、精密機械、記録材料（写真感光剤、磁気材料等）等のあらゆる分野において吸湿に起因する酸化等による製品等の品質劣化を防ぐ目的で、シリカゲル、塩化カルシウム、生石灰、ゼオライト等の乾燥剤や、塩化カルシウム等の潮解性乾燥剤が用いられている。これらの乾燥剤は、上記用途において粒状、あるいは粉末の形態で紙、不織布等により包装されるか、もしくは容器等に封入された状態で、製品とともに包材へ投入されて用いられている。そのために、乾燥剤が本来有する優れた吸湿効果及び吸湿速度が低下したり、包装材破損による、製品への乾燥剤の付着、混入などの問題が発生していた。また、塩化カルシウム等の潮解性乾燥剤の使用に際しては、吸湿液化現象による弊害なども問題になっている。この問題は、熱可塑性樹脂シートを乾燥剤の包装材料として用いたり、不織布と乾燥剤とをサンドイッチ状に包含加工したものをを用いることにより解決されるが、これらはいずれもコストアップ等の問題につながる。

【0003】また、特開平3-109917号公報には、熱可塑性樹脂に式 $\text{MgSO}_4 \cdot n\text{H}_2\text{O}$ （ただし $0 \leq n \leq 3$ ）で表される硫酸マグネシウム、酸化アルミニウム、酸化バリウム及び酸化ケイ素から選択される1種以上の乾燥剤を混練することにより、高い吸湿力及び保水力を有し、しかも飛散性、吸湿性、潮解性による液体

漏洩等の欠点を生じない乾燥剤成形品が得られることを開示している。特開平5-39379号公報には、熱可塑性樹脂に式 $\text{MgSO}_4 \cdot n\text{H}_2\text{O}$ （ただし $0 \leq n \leq 3$ ）で表され、平均粒子径が $30 \mu\text{m}$ 以下である硫酸マグネシウムを配合した調湿性組成物を用いることにより、湿度を一定湿度に保持することのできる調湿性成形品が得られると開示している。これらの乾燥剤成形品は、食品、医薬品、化粧品、嗜好品、精密機械、機械部品等幅広い分野での品質保護のための乾燥剤あるいは吸湿性包材として有効なものである。

## 【0004】

【発明が解決しようとする課題】しかしながら、本発明者らはさらに研究を進めた結果、上記技術ではいまだ不十分であることが判った。前記技術は「乾燥剤」に係るものであって、主として吸湿力及び保水力を高めることのみを目的としたものであり、上記製品の保存には吸湿力及び保水力だけでは解決できない課題が存在するのを見いだした。すなわち、従来の吸湿による劣化のみならず、外部から侵入してきたガス、製品自身から発生したガス等による更なる劣化があることが判明した。特に、写真感光材料、磁気材料等のポリマー支持体を基材とする記録材料を長期間保存する場合、基材であるアセテートフィルムの吸湿に起因する酢酸ガス、製造時の有機溶媒の残存による溶剤ガス、或いは外部から侵入するガス等の有害ガスにより、品質が劣化してしまったり、臭いを放ったりしていた。特に、記録材料の場合、このガスによる劣化は情報記録性能に直接影響を受け、致命的な欠陥となってしまう。

【0005】従来では、この記録材料の保存は、密封保存、冷暗所保存、低温保存などをするにより品質の劣化を最小限にとどめるという消極的かつ不完全な方法でしかなかった。コダック社製のモレキュラシープを用いる方法があるが、このモレキュラシープを用いる方法は、速効性であるが、持続性がないという問題があった。このように、該記録材料等の製品の保存において、長期保存において吸湿のみならず吸ガスによる劣化の有効な劣化防止手段はなかった。

【0006】従って、本発明の目的は、保存における吸湿及び吸ガスによる各種製品の品質の劣化を長期にわたって防止することができ、更に該製品の品質、機能を安全且つ有効的に保存可能な調湿・吸ガス性成形品を提供することにある。

## 【0007】

【課題を解決するための手段】本発明者らは、鋭意検討した結果、熱可塑性樹脂に特定の調湿性物質と特定の吸ガス性物質とを混練することにより、上記目的を達成することができるのを見だし、本発明を完成したものである。すなわち本発明は、下記構成である。

(1) 熱可塑性樹脂を、調湿性の $\text{MgSO}_4 \cdot n\text{H}_2\text{O}$ （ただし $0 \leq n \leq 3$ ）で表され、平均粒子径が $1 \sim 3$

0  $\mu\text{m}$ である硫酸マグネシウムと、 $\text{MgO}$ 及び $\text{Al}_2\text{O}_3$ を含有した吸ガス性の組成物とともに混練成形して得られることを特徴とする調湿・吸ガス性成形品。

(2) 熱可塑性樹脂を、調湿性の $\text{MgSO}_4 \cdot n\text{H}_2\text{O}$  (ただし $0 \leq n \leq 3$ ) で表され、平均粒子径が1~30  $\mu\text{m}$ である硫酸マグネシウムと、 $\text{MgO}$ 及び $\text{Al}_2\text{O}_3$ を含有した吸ガス性の組成物とともに混練成形して得られることを特徴とするポリマー支持体を基材とする記録材料の保存用調湿・吸ガス性成形品。

(3) 酢酸ガスを吸収する能力を有することを特徴とする上記(1)又は(2)に記載の調湿・吸ガス性成形品。

(4) 吸湿度あるいは吸ガス度を示すインジケータ機能を有することを特徴とする上記(1)又は(2)に記載の調湿・吸ガス性成形品。

#### 【0008】

【作用】本発明の調湿・吸ガス性成形品は、熱可塑性樹脂、調湿性の $\text{MgSO}_4 \cdot n\text{H}_2\text{O}$  (ただし $0 \leq n \leq 3$ ) で表され、平均粒子径が1~30  $\mu\text{m}$ である硫酸マグネシウム(調湿剤ともいう)及び $\text{MgO}$ と $\text{Al}_2\text{O}_3$ を含有した吸ガス性の組成物(吸ガス剤ともいう)を混練成形されているため、調湿性を有するばかりでなく、吸ガスを有する。これにより、吸湿による劣化とともに有害ガスによる製品の劣化を防止できる。更に、前記調湿剤及び吸ガス剤は熱可塑性樹脂で囲まれ、水分やガスとの接触面積が制限されているため急激に反応せず、徐々に水蒸気やガスが成形品の内部に入り込むことにより反応が緩やかに進行し、その結果長期間にわたって調湿・吸ガス能力が持続し、いわゆる遅効性を発揮する。そして、開放系でもこの性能を長期間維持することができ、出し入れのある容器でも能力の急減はない。

【0009】特に、写真感材、磁気材料等のポリマー支持体を基材とする記録材料の保存においては、吸湿、及びガスによる材料の劣化は長期間にわたって徐々に起こるので、長期間にわたって安定した調湿、吸ガス能力が必要であり、急激な反応はかえって劣化を促進することもあり好ましくない。従って、本発明の成形品は、特に記録材料に好適に用いられる。更に、本発明の成形品は、アルカリ性吸ガス剤を用いているため、酸性ガスを吸着しないしは捕捉するのに適している。従って、支持体にTAC等のアセテートフィルムを用いた記録材料の場合、本発明の成形品は保存中に発生する吸湿による酢酸ガスを吸収するのに好適である。

【0010】本発明に用いる調湿剤は、吸湿した水分を結晶水として自身の分子構造内に取り込み安定化するので、吸湿された水分は液状としては存在しないから、成形体自体は乾燥し、水滴の発生もない。更に、本発明の成形品を切断したとしても、水分の流出はない。従って、成形体の表面の水分による接着、変色、カビの発生等はない。また、本発明の成形品に、吸湿度、あるいは

吸ガス度を示すインジケータ機能を持たせることで、交換時期を示唆することができ、より安定的に製品の保存が可能となる。本発明の成形品を用いることにより、湿度を30~40%RHに調湿することができ、且つ腐食性有害ガスを吸収することで、カビの発生やさびや腐食の発生を防止することができる(なお、一般的にカビは60%RH以上の湿度で繁殖する)。また、調湿剤や吸ガス剤を熱可塑性樹脂内部に埋設して、粉状の調湿剤や吸ガス剤が飛散しないため、該薬剤が製品に付着して、汚したりせず、清浄な状態を保つことができる。また、本発明の成形品は、吸水発熱性はないので、製品に発熱による悪影響を与えることもない。

【0011】本発明における熱可塑性樹脂としては、特に限定されず公知のものを使用できるが、例えばポリエチレン(PE)、ポリプロピレン(PP)、ポリカーボネート(PC)、ポリアセタール(ポリオキシメチレンPOM)、ポリテレフタル酸ブチレン(PBT)、ポリテレフタル酸エチレン(PET)、ポリフェニレンオキシド(PPO)、ポリアミド(PA)、エチレン-酢酸ビニル共重合体(EVA)、エチレン-メタクリレート共重合体、ポリ塩化ビニル(PVC)、ポリスチレン(PS)、アクリロニトリル-ブタジエンスチレン共重合体(ABS)、アクリロニトリル-スチレン共重合体(AS)、ポリエステル、ポリアクリル酸エステル、ポリ塩化ビニリデン(PVDC)等が挙げられ、これらのうち1種又は2種以上を用いることができる。上記の中で、好ましくはポリエチレン樹脂であり、より好ましくは、低密度ポリエチレン樹脂(例えば、密度としては、0.910~0.930  $\text{g}/\text{cm}^3$ )である。これを用いることにより、成形品に対する水分、ガスの透過性が適切で、より良好な調湿性、吸ガスを有し、且つ良好な効果の持続性も有するようになる。

【0012】本発明において熱可塑性樹脂とともに用いる調湿剤の平均粒子径は、1~30  $\mu\text{m}$ であり、好ましくは2~15  $\mu\text{m}$ である。

【0013】本発明において熱可塑性樹脂とともに用いる調湿剤は、熱可塑性樹脂100重量部に対して、調湿剤を好ましくは5~400重量部、より好ましくは10~50重量部配合して用いる。本発明で用いる調湿剤は、卓越した調湿性を有するとともに、熱可塑性樹脂に対して優れた分散性を有している。ここで、調湿性とは、十分な吸湿力及び保水力を有しつつ、あらかじめ設定した低湿度を維持できる性能をいう。

【0014】また、熱可塑性樹脂及び調湿剤とともに用いる吸ガス剤としては、 $\text{MgO}$ と $\text{Al}_2\text{O}_3$ を含有した組成物であればいずれのものでもよい。吸ガス剤としては、 $\text{MgO}$ を3.2.3重量%~4.6重量%含み、 $\text{Al}_2\text{O}_3$ を13.6重量%~18.0重量%含むものが好ましく、より好ましくは $6\text{MgO} \cdot \text{Al}_2\text{O}_3 \cdot \text{CO}_2 \cdot n\text{H}_2\text{O}$  ( $10 \leq n \leq 20$ ) で示される組成物であ

る。ここで $n$ としては、好ましくは $1.3 \leq n \leq 1.5$ の範囲である。吸ガス剤としては、具体的には、トミックスAD-500（富田製薬（株）製）等を挙げることができる。吸ガス剤は、熱可塑性樹脂100重量部に対して、該吸ガス剤を好ましくは1～100重量部、より好ましくは5～50重量部配合して用いる。本発明に用いる吸ガス剤は卓越した吸ガス性を有するとともに、熱可塑性樹脂に対して優れた分散性を有している。ここで、吸ガス性とは、各種製品から発生する種々のガス、及び外部から侵入するガスを吸収、捕捉できる性能をいう。ここで、本発明の成形品が吸収、捕捉できるガスとしては、酢酸ガス、アンモニア、硫化水素、亜硫酸、塩化水素、アセトアルデヒドなどの有害ガス、本発明の場合、特に酸性ガスを吸着ないし捕捉することができ、取り込んだ酸性ガスはアルカリ性の吸収剤で中和することができる。また、本発明の場合、トリメチルアミン等の悪臭を有するガスを吸収できるとともに、脱臭効果も有する。

【0015】前記の吸ガス剤は、各々使用に際して平均粒子径1～50 $\mu\text{m}$ とするのが好ましく、より好ましくは2 $\mu\text{m}$ ～15 $\mu\text{m}$ である。これにより、熱可塑性樹脂に混練し易くなり、更に吸ガス性能が適正になる。調湿剤と吸ガス剤は、同じ平均粒子径のものをを用いてもよく、また各々異なった粒子径のものを使用し、混合して用いてもよい。

【0016】本発明において混練する原料の割合は特に限定されないが、製品の保管場所や、温度、湿度、密閉、非密閉、保管時間等の保管条件に応じて適宜選択することが好ましい。該割合は、通常、熱可塑性樹脂100重量部に対し、前記の調湿剤5～400重量部、吸ガス剤1～100重量部とを配合するのが好ましく、更には、調湿剤10～50重量部、吸ガス剤5～50重量部とを配合して用いることがより好ましい。調湿剤及び吸ガス剤の割合が前記範囲の場合には、より高い調湿性及び吸ガス性を有し、しかも成形適性に優れたものを得ることができる。

【0017】具体的には、上記量にすることにより、成形品に含まれる調湿剤と同重量まで吸湿することができる。更に、調湿能力としては、湿度30～40RH%に長期間維持できる。

【0018】本発明の成形品は、吸湿度又は吸ガス度を示すインジケータ機能を有することが好ましい。ここで、インジケータ機能とは、ある一定量の水分又はガスを吸収、捕捉すると、色や濃度が変化して、該成形品の性能の終点を示す機能のことをいう。例えば、水分に感応して全体の色が青紫から明るいピンクに変化する化合物を添加しておくことにより、本発明の調湿・吸ガス性成形品に対して色変化による終点表示機能を持たせることが出来る。成形品にインジケータ機能を持たせる方法としては、インジケータ機能を有する化合物を成

形品に添加する方法が挙げられる。該化合物としては、特開平3-277659号公報に記載の無水塩化コバルトを含む組成物などを挙げることができる。

【0019】インジケータ機能を有する化合物の添加量は、特に限定されず、該成形品の用途、保管条件、該化合物の種類等により適宜設定できるが、熱可塑性樹脂100重量部に対して、好ましくは0.2～5重量部、より好ましくは0.5～3重量部である。

【0020】本発明の調湿・吸ガス性成形品の製造方法としては、特に制限はなく、通常次のような方法で製造することができる。前記熱可塑性樹脂、調湿剤・吸ガス剤及びその他の添加剤を、ミキシングロール等の混練機、成形機、混練成形機等を用い、約100～350℃で約5～40分間混練し、成形すればよい。

【0021】このようにしてなる本発明の調湿・吸ガス性成形品は、押出成形、共押出成形、射出成形、中空成形、押出コーティング成形、架橋発泡成形等により、フィルム状、シート状、プレート状もしくはベレット状の形状に加工成形することができる。本発明においては、プレート状に成形することが好ましい。また、フレキシブル性を持ったものが好ましい。特に、ポリマー支持体を基材とする記録材料に用いる場合には、特にプレート状に成形することで、該記録材料と同一容器内に添付格納することができ、有効に本発明の効果が得られる。なお、成形品の一態様として、プレート状に成形したものの断面構造の模式図を図1に示す。しかし、本発明の内容がこれらに限定されるものではない。図1において、熱可塑性樹脂1の内部に、調湿剤2、吸ガス剤3、インジケータ化合物4が各々混練されており、これにより良好な調湿性、吸ガス性及びその性質の持続性を有するようになる。

【0022】本発明の成形品は、長期にわたる吸湿、ガス吸収により製品の劣化を防止する必要がある製品であればいずれのものにも用いることができる。例えば、食品、医薬品、電子部品、精密機械、記録材料（写真感光材料、磁気材料等）等を挙げることができる。本発明の成形品は、前述の如く、記録材料（写真感光材料、磁気材料等）に好ましく用いることができる。ここで記録材料とは、ポリマー支持体を基材とする記録材料のことであり、例えばハロゲン化銀感光材料などの写真感光材料及びオーディオテープ、ビデオテープ、フロッピーディスクなどの磁気記録材料を挙げることができる。特に、TAC等のアセテートフィルムを有する記録材料の長期保存には好ましく用いることができる。

【0023】本発明の成形品の使用方法としては、保存対象である製品の格納用容器あるいは包装材料に、製品とともに格納してもよいし、本発明の成形品自体が容器、あるいは包装材料になってもよい。また、本発明の成形品の使用に際して、記録材料等の保存対象製品の含水率を40%以下にして、本発明の成形品とともに密封

するのが好ましい。このような条件下で使用すれば、その寿命は半永久的である。しかし、該成形品と保存対象製品とは完全に密封する必要はなく、完全に外に出していても、日本の気候なら少なくとも1年は使用でき、実用的には、完全に密封しなくても数年にわたって使用

できる。

【0024】本発明の成形品（1枚の容積：1.0 cm<sup>3</sup>）の使用範囲の目安を、下記記録材料を一例として次に示す。

(イ) 完全密封系（5年以上）	本発明の成形品の枚数／記録材料の量
35mmロール・フィルム	2枚／305m (1000ft)
16mmロール・フィルム	1枚／305m (1000ft)
1/2 in. テープ	1枚／T-120×10本
キャビネサイズフィルム	1枚／100枚
5 in. フロッピー・ディスク	1枚／100枚
CDディスク	1枚／100枚

【0025】

(ロ) 一部開放系（2年前後）	
35mmロール・フィルム	3枚／305m (1000ft)
16mmロール・フィルム	1枚／152m (500ft)
1/2 in. テープ	1枚／T-120×3～5本
キャビネサイズフィルム	1枚／25～50枚
5 in. フロッピー・ディスク	1枚／25～50枚
CDディスク	1枚／25～50枚

【0026】なお、既にガスの発生が著しいフィルムの場合、完全密封は避けることが好ましい。記録材料の保存の前準備として、映画用等のロール状態のフィルムはクリーニング・マシン又は再水洗機を通してフィルムを巻き替えるとともに、再乾燥後に調湿・吸ガス性成形品を入れると、本発明の作用効果が一層高まる。その他、本発明ではTAC支持体を基材とする記録材料の場合、TACの変質を促進する鉄イオンを含有しないように素材を選定することが好ましい。

【0027】

【実施例】以下実施例を示し、本発明の内容を具体的に説明するが、本発明の内容がこれらに限定されるものではない。

#### 実施例1

低密度ポリエチレン（住友化学工業（株）製スミカセン G-806 密度0.917 g/cm<sup>3</sup>）100重量部に、平均粒径4.59 μmのMgSO<sub>4</sub>を30重量部、及び富田製薬（株）製トミックスAD-500（酸化アルミニウム17.15重量%、酸化マグネシウム37.24重量%、二酸化炭素8.10重量%、乾燥減量5.32重量%、見かけのかさ23 ml/10 g）10重量部を混練押出成形機（株式会社池貝製PCM45二軸押出機）で混練したのち、ホットカットで造粒してペレットを作製した。次いで、このペレットを射出成形機（日精樹脂工業（株）製 PS-20E2VSE）を用いて85 mm×54 mm×1.5 mmの調湿・吸ガス性プレートを作製した。このプレート2枚を試料として、空間容積900 cm<sup>3</sup>のガラス容器に入れた。それとは別にデシケーター内に90%酢酸を入れ、25℃で静置してから、該デシケーター内の50 cm<sup>3</sup>の気体を採取して前記

ガラス容器内に導入し、酢酸ガスの濃度を調整した。ここで、該気体の導入直後のガラス容器内の酢酸ガス濃度、及び湿度は、各々酢酸ガス濃度2.2 ppm、湿度100% RH（25℃）であった。

【0028】これを25℃に保存し、所定の時間（表-1参照）経過後、北川式ガス検知器を用いて容器内に残存している酢酸ガスの濃度及び湿度を測定し、吸ガス性、調湿性を評価した。なお、初期の酢酸ガス濃度の設定はアセテートフィルムの加水分解により生成する汎用容器内の酢酸ガス濃度である。その結果を表-1、及び図2、3に示す。

【0029】

【表1】

表-1 容器内の相対湿度と酢酸ガス濃度の変動

時間	酢酸ガス濃度	相対湿度
開始時	22 ppm	RH10.0 %
1時間	0.7 ppm	—
3時間	0.6 ppm	—
7時間	0.5 ppm	—
12時間	—	RH30.5 %
1日	0.33 ppm	RH29.6 %
2日	—	RH26.6 %
3日	—	RH24.8 %
4日	0.23 ppm	RH23.2 %
5日	—	RH22.3 %
6日	0.14 ppm	RH21.4 %
7日	—	RH21.7 %
8日	—	RH21.3 %
9日	—	RH21.6 %
11日	—	RH22.2 %
13日	N. D.	RH21.8 %

【0030】これらの結果から、本発明の試料は、表-1及び図2に示すように酢酸ガスを少なくとも13日目には検出できないレベルにまで吸収でき、更に表-1及び図3に示すように水分を効果的に吸収し、6日目以降には約21%付近に湿度が一定に保持できていることがわかる。

#### 【0031】実施例2

実施例1において用いた調湿・吸ガス性プレート2枚を、900mlの硝子容器に投入し、容器内をRH100%に調製し、温湿度データ集積装置TRH-DM2及び温湿度センサー平型タイプTHP-13（神栄（株）製）を装着したシリコン栓で容器を密封する。そして、経時的に容器内湿度を測定する。測定データの変動が殆どなくなった時点で、再びRH100%に容器内を調製

し、吸湿を行わせる。このような操作を繰り返し行った。一方、上記と同様の容器をシリコン栓で密封した上で、容器内の酢酸ガス濃度を20ppmに調製し、その後栓に設置した測定口を開け、ガス検知管（（株）ガステック製）にて経時的にガス濃度を測定した。容器内のガス濃度がN. D. になるまで測定する、その後酢酸ガスを再び導入し、20ppmに調製し、再び吸ガスを行わせる操作を繰り返し行った。上記のように、各々調湿性テスト、吸ガス性テストを行い、この操作を長期間繰り返した。それらの結果を、吸ガス性は図4に、調湿性は図5に示した。図4、図5の結果から、本発明の試料は、酢酸ガス及び水分の吸収性が優れ、且つそれが長期間持続することが判る。

#### 【0032】実施例3

含水率36.0g/1000フィートの映画用35mmフィルム400フィートと、実施例1で得た85mm×54mm×1.5mmの調湿・吸ガス性プレート1.5枚とを、低密度ポリエチレン製の袋（380mm×180mm×40μm）に入れ、この袋をさらに汎用の映画用フィルム保存缶（径180mm高さ40mm）に入れた。そして、保存缶の本体と蓋の合わせ目をビニールテープで封鎖した状態および未封鎖の状態の各々の場合に、25℃における保存缶内の湿度の時間的变化を、温湿度データ収録装置TRH-DM2（神栄株式会社製）および温湿度センサー平型タイプTHP-13（神栄株式会社製）を用いて測定した。なお、温湿度センサーの設置位置は、低密度ポリエチレン製袋の内側およびポリエチレン製袋の外側で保存缶の内側とした。また、比較例として、現行の保存状態、具体的には、映画用フィルムを市販のポリエチレン製袋の内側に入れ、開口状態のまま金属製缶に入れたもの（ブランクという）を上記と同一条件下で実施した。ブランクのセンサー設置位置は、ポリエチレン製袋の内側及びポリエチレン製袋の外側とした。その結果を表-2及び図6、図7に示した。

#### 【0033】

#### 【表2】



表-2

日数	ポリエチレン製袋内の相対湿度			ポリエチレン製袋外の相対湿度		
	密封状態	未密封状態	ブランク	密封状態	未密封状態	ブランク
S	RH 43.1%	RH 42.9%	RH 43.0%	RH 55.4%	RH 40.1%	RH 39.9%
1日	RH 30.1%	RH 36.2%	RH 43.2%	RH 30.8%	RH 54.9%	RH 58.1%
3日	RH 30.2%	RH 36.5%	RH 43.7%	RH 30.5%	RH 57.2%	RH 59.5%
5日	RH 29.8%	RH 36.8%	RH 43.8%	RH 30.4%	RH 58.0%	RH 60.1%
7日	RH 30.2%	RH 37.1%	RH 43.8%	RH 30.8%	RH 58.3%	RH 60.4%
9日	RH 29.9%	RH 37.5%	RH 44.1%	RH 30.9%	RH 58.9%	RH 61.2%
13日	RH 30.2%	RH 38.5%	RH 45.3%	RH 31.1%	RH 59.8%	RH 61.8%
16日	RH 30.5%	RH 39.6%	RH 46.5%	RH 30.8%	RH 60.1%	RH 62.1%
19日	RH 30.4%	RH 40.1%	RH 46.4%	RH 31.5%	RH 60.1%	RH 63.1%
22日	RH 30.7%	RH 40.4%	RH 47.6%	RH 31.1%	RH 59.8%	RH 63.0%
26日	RH 30.6%	RH 40.6%	RH 48.6%	RH 31.5%	RH 60.3%	RH 62.8%
30日	RH 30.9%	RH 41.2%	RH 49.8%	RH 31.8%	RH 63.1%	RH 67.2%
34日	RH 31.1%	RH 41.8%	RH 50.2%	RH 32.5%	RH 62.5%	RH 65.4%
38日	RH 31.4%	RH 42.3%	RH 50.6%	RH 33.0%	RH 62.3%	RH 65.2%
42日	RH 31.4%	RH 42.5%	RH 51.2%	RH 33.2%	RH 63.1%	RH 66.7%

【0034】表-2及び図6の結果から、ポリエチレン製袋内においては、本発明の試料は従来の状態であるブランクに比べて、未密封、密封をとわず相対湿度が低いところで保持されていることが判る。従って、密封していなくとも、本発明の試料を用いると、低湿度状態に保持できる。更に、未密封よりも密封状態のほうがより低い湿度で保存可能であることが判る。一方、表-2及び図7の結果から、ポリエチレン製袋外においては、密封状態にしていれば、本発明の試料は、該袋の外であっても、低湿度状態に保持できることが判る。これらの結果から、本発明の試料は封鎖状態でも未封鎖状態でも水分を吸収し、内容物を効果的に保存できることがわかる。また、封鎖状態と未封鎖状態とを比較すると、封鎖状態の方がより長期的に保存できることがわかる。

#### 【0035】実施例4

実施例1で作製した調湿・吸ガス性プレートに、湿度50RH%と75RH%の各々の雰囲気中に長時間静置した。その時の該プレートの吸湿率を、該プレートの重量増加量(重量%)で示した。その吸湿率経時変化は図8に示すとおりであった。これにより、該プレートの吸湿力(吸湿速度、吸湿終点)が判る。

#### 【0036】

【発明の効果】本発明の調湿・吸ガス性成形品により、保存における吸湿及び吸ガスによる各種製品の品質の劣

化を長期にわたって防止することができ、更に該製品の品質、機能を安全且つ有効に保存可能となる。

#### 【図面の簡単な説明】

【図1】本発明の調湿・吸ガス性成形品の一例の断面構造を示す模式図である。

【図2】本発明の調湿・吸ガス性成形品の酢酸ガス吸収の経時変化の結果を示すグラフである。

【図3】本発明の調湿・吸ガス性成形品の吸湿率経時変化の結果を示すグラフである。

【図4】本発明の調湿・吸ガス剤プレートの繰り返し酢酸ガス吸収テストの結果を示すグラフである。

【図5】本発明の調湿・吸ガス剤プレートの繰り返し吸湿テストの結果を示すグラフである。

【図6】本発明の調湿・吸ガス性成形品のポリエチレン製袋内の吸湿特性を示すグラフである。

【図7】本発明の調湿・吸ガス性成形品のポリエチレン製袋外の吸湿特性を示すグラフである。

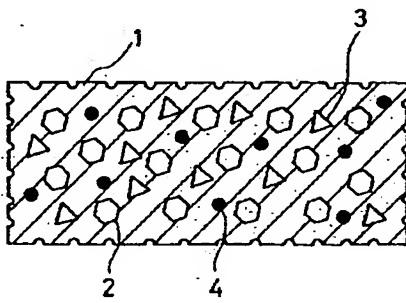
【図8】本発明の調湿・吸ガス性成形品の吸湿率経時変化を示すグラフである。

#### 【符号の説明】

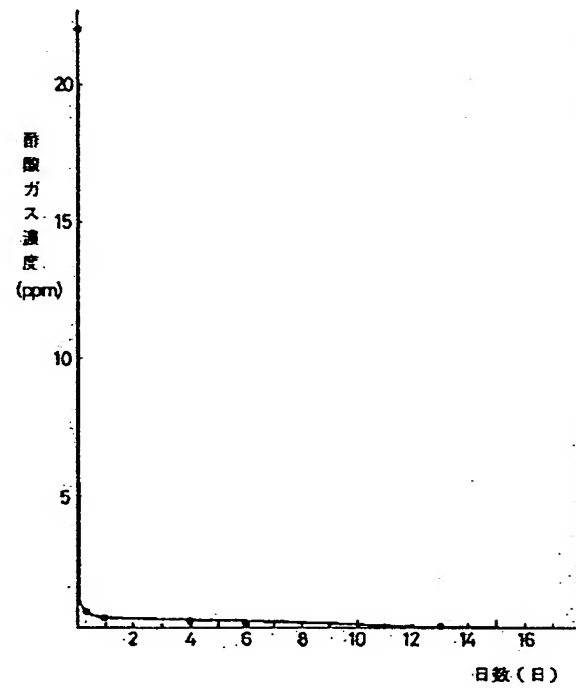
- 1 熱可塑性樹脂
- 2 調湿剤
- 3 吸ガス剤
- 4 インジケータ化合物



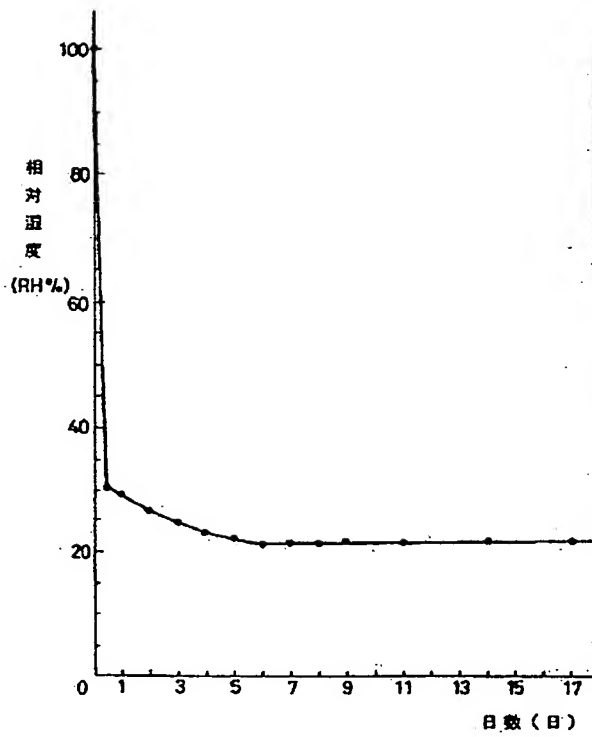
【図1】



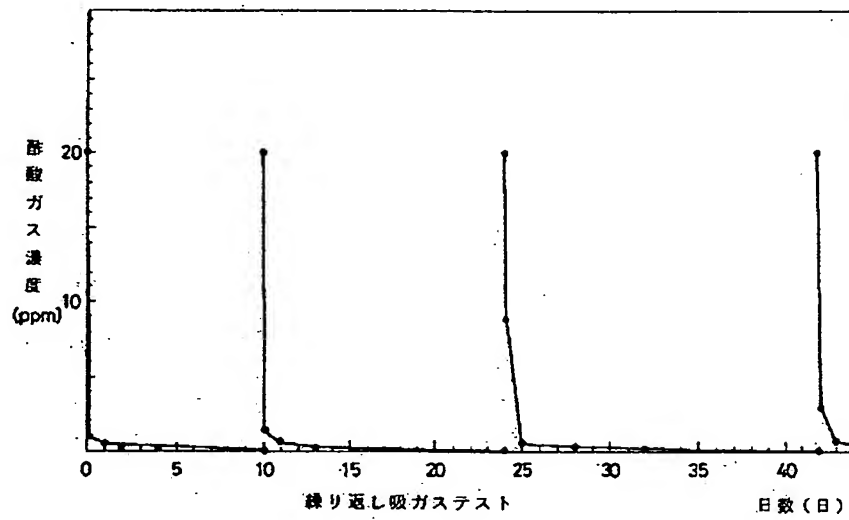
【図2】



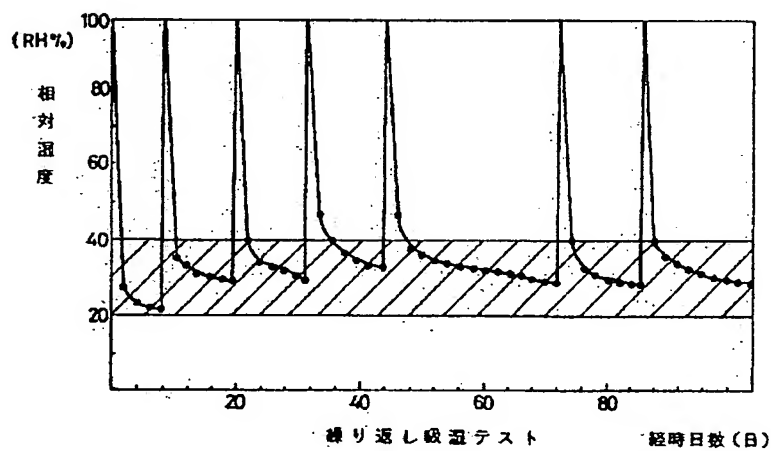
【図3】



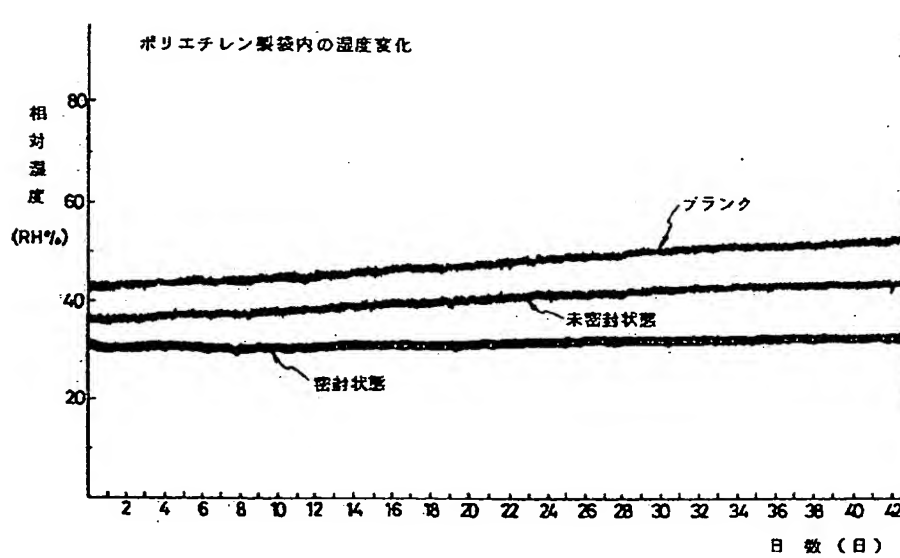
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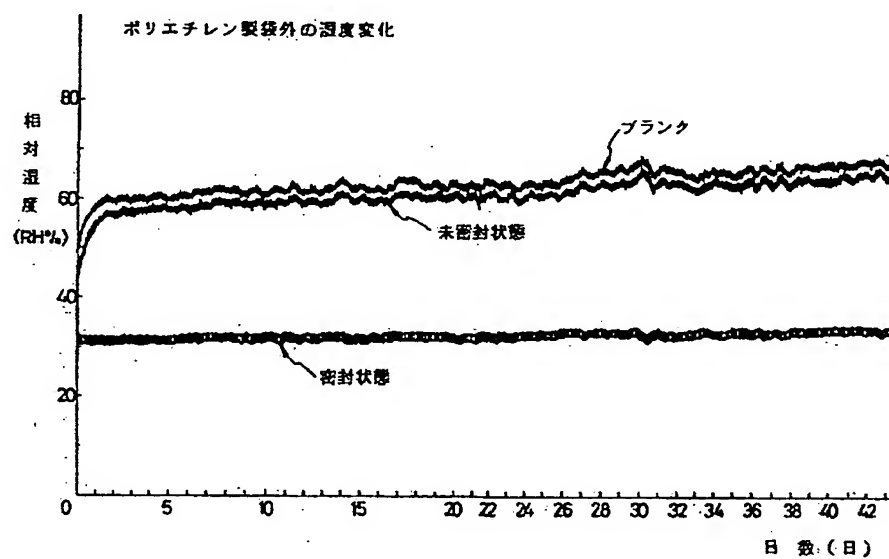
【図5】



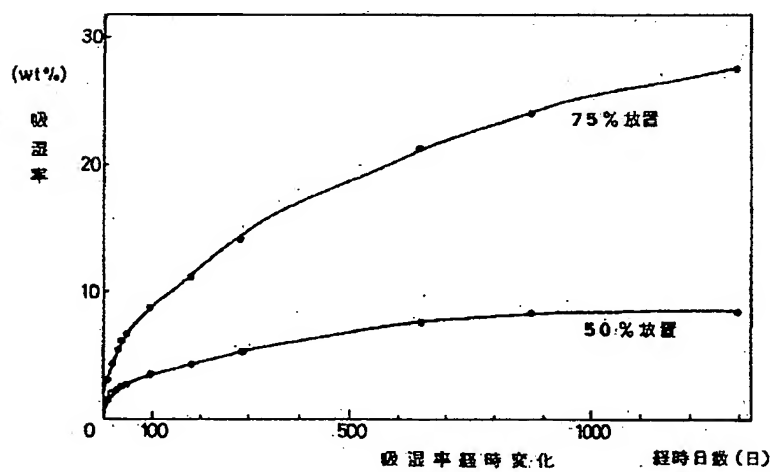
【図6】

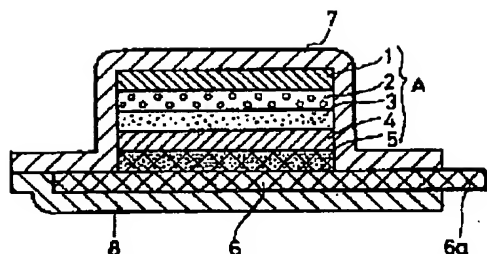


【図7】



【図8】





WPI Acc No: 1996-439674/ 199644

XRAM Acc No: C96-138337

Moisture-regulating and gas-absorbing moulding for storing drugs, etc. -  
obtd. by kneading and moulding thermoplastic resin with moisture  
regulating magnesium sulphate and gas absorbing compsn.

Patent Assignee: FUJI PHOTO FILM CO LTD (FUJF ); SASAKI KAGAKU YAKUJIN KK  
(SASA-N)

Number of Countries: 001 Number of Patents: 001

Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week
JP 8217913	A	19960827	JP 9526874	A	19950215	199644 B

Priority Applications (No Type Date): JP 9526874 A 19950215

Patent Details:

Patent No	Kind	Lan Pg	Main IPC	Filing Notes
JP 8217913	A	10	C08K-003/30	

Abstract (Basic): JP 8217913 A

Moisture-regulating and gas-absorbing moulding is formed by kneading and moulding thermoplastic resin with moisture regulating magnesium sulphate of formula,  $MgSO_4 \cdot nH_2O$  ( $n = 0-3$ ) and 1-30 micron in average particle size and a gas-absorbing compsn. contg. magnesium oxide and alumina.

USE/ADVANTAGE - The moulding is useful for storing e.g. recording material (e.g. video tape or floppy disk), food, drugs or electronic parts for a long period without deterioration. The moulding prevents the deterioration of goods stored by the absorption of moisture or gases for a long period.

The moulding has activity for absorbing acetic acid gas. The moulding indicates the degree of absorption of moisture or gases. Pref. thermoplastic resin is e.g. polyethylene, polypropylene or polycarbonate, pref. low density polyethylene. The amt. of moisture-regulating magnesium sulphate used is 5-400 pts.wt. (10-50) pts.wt. per 100 pts.wt thermoplastic resin. Gas-absorbing agent contg.

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MgO and Al<sub>2</sub>O<sub>3</sub> is pref. e.g. a compsn. of formula, 6MgO-Al<sub>2</sub>O<sub>3</sub>·nH<sub>2</sub>O (n = 10-20) (e.g. 'Tomix AD-500' (RTM)). The amt. of gas-absorbing agent used is 1-100 (5-50) pts.wt. per 100 pts.wt. thermoplastic resin. The average particle size of the gas-absorbing agent is 1-50 (2-15) micron. The gas-absorbing agent absorbs gases such as acetic acid, ammonia, hydrogen sulfide, hydrochloric acid, acidic gas or trimethylamine. A humidity of 30-40 RH % can be retained for a long period by the moulding. The moulding opt. contains a cpd. having indicator function by colour change such as a compsn. contg. anhydrous cobalt, chloride. The moulding is made by e.g. extrusion-moulding and the form is pref. plate.

Dwg. 0/8

Title Terms: MOIST; REGULATE; GAS; ABSORB; MOULD; STORAGE; DRUG; OBTAIN;  
KNEAD; MOULD; THERMOPLASTIC; RESIN; MOIST; REGULATE; MAGNESIUM; SULPHATE;  
GAS; ABSORB; COMPOSITION

Index Terms/Additional Words: RECORDING; MATERIAL; FOOD

Derwent Class: A97; B07; E33; J01; L03

International Patent Class (Main): C08K-003/30

International Patent Class (Additional): B01D-053/14; C08K-003/22;  
C08L-101/00

File Segment: CPI

Manual Codes (CPI/A-N): A08-M04; A08-M10; A12-P01; B04-C03B; B05-A01B;

B05-A03; B11-C06; E34-B03; J01-E03C; L03-B05D3; L03-J

Chemical Fragment Codes (M1):

\*01\* H7 H721 M210 M212 M320 M416 M423 M424 M431 M610 M740 M782 M903 M904  
M910 R043 R045 V743 R00326-M R00326-Q

\*02\* H7 H721 M210 M213 M231 M320 M416 M423 M424 M431 M610 M740 M782 M903  
M904 M910 R043 R045 V743 R00964-M R00964-Q

Chemical Fragment Codes (M2):

\*03\* A212 A940 C108 C316 C540 C730 C801 C802 C803 C804 C805 M411 M424  
M431 M740 M782 M903 M904 M910 R043 R045 R01680-M

Chemical Fragment Codes (M3):

\*03\* A212 A940 C108 C316 C540 C730 C801 C802 C803 C804 C805 M411 M424  
M431 M740 M782 M903 M904 M910 R043 R045 R01680-M

Polymer Indexing (PS):

<01>

\*001\* 018; R00326 G0044 G0033 G0022 D01 D02 D12 D10 D51 D53 D58 D82;  
H0000; H0317; S9999 S1434; P1172 P1161; S9999 S1581; P1150

\*002\* 018; R00964 G0044 G0033 G0022 D01 D02 D12 D10 D51 D53 D58 D83;  
H0000; H0317; S9999 S1434; S9999 S1581; P1150 ; P1343

\*003\* 018; H0317; P0862 P0839 F41 F44 D01 D63; S9999 S1434; S9999 S1581

\*004\* 018; ND01; ND04; Q9999 Q9370; Q9999 Q8366-R; B9999 B3383-R B3372;  
B9999 B3407 B3383 B3372; N9999 N6439; N9999 N6440-R; Q9999 Q8855-R;  
Q9999 Q7589-R; Q9999 Q8059 Q7987; N9999 N5970-R

\*005\* 018; R01680 D00 F60 Mg 2A O- 6A S-; A999 A022 A000; S9999 S1456-R;  
B9999 B5209 B5185 B4740

\*006\* 018; D00 F20 F44 Mg 2A Al 3A C- 4A O- 6A; A999 A000-R; S9999  
S1456-R; B9999 B5209 B5185 B4740

\*007\* 018; G2700-R D00 D70 Co 8B Tr Cl 7A; A999 A748

Derwent Registry Numbers: 0326-S; 0326-U; 0964-S; 0964-U; 1680-U

Specific Compound Numbers: R00326-M; R00326-Q; R00964-M; R00964-Q; R01680-M

XRPX Acc No: N97-234678

Organic EL element with lamination body with opposed pair of electrodes - has organic luminescent material layer with organic compound located between opposed electrodes, it emits light by supplying electrons & holes to luminescent material layer

Patent Assignee: PIONEER ELECTRONIC CORP (PIOE ); TOHOKU PIONEER ELECTRONIC CORP (PIOE ); TOHOKU PIONEER KK (PIOE )

Inventor: KAWAMI S; NAITO T; NAKADA H

Number of Countries: 005 Number of Patents: 005

Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week
EP 776147	A1	19970528	EP 96118582	A	19961120	199726 B
JP 9148066	A	19970606	JP 95306143	A	19951124	199733
US 5882761	A	19990316	US 96746977	A	19961119	199918
EP 776147	B1	20010801	EP 96118582	A	19961120	200144
DE 69614228	E	20010906	DE 614228	A	19961120	200159
			EP 96118582	A	19961120	

Priority Applications (No Type Date): JP 95306143 A 19951124

Cited Patents: EP 350907; EP 500382; US 5189405

Patent Details:

Patent No Kind Lan Pg Main IPC Filing Notes

EP 776147 A1 E 7 H05B-033/12  
Designated States (Regional): DE FR GB  
JP 9148066 A 4 H05B-033/04  
US 5882761 A H01J-001/52  
EP 776147 B1 E H05B-033/12  
Designated States (Regional): DE FR GB  
DE 69614228 E H05B-033/12 Based on patent EP 776147

Abstract (Basic): EP 776147 A

The organic EL element (1) has a laminated body (6) with a pair of opposed electrodes (3 & 5) and an organic luminescent material layer (4). The layer has an organic compound and is located between the electrodes. It emits light by supplying electrons and holes to the luminescent material layer from the electrodes.

The body is contained in an airtight container (10) to isolate the body from the external atmosphere. A drying substance (8) is in the container but spaced from the body to absorb moisture in the body's internal space. The drying substance comprises a solid compound which chemically absorbs the moisture and maintains its solid state even after absorbing moisture.

USE - For use in display device or light emission element for e.g. information industry.

ADVANTAGE - Maintains stable light emission property for long period of time.

Dwg.1/2

MACHINE TRANSLATION  
FOR  
CASE SIN 10/031,622

**MOISTURE ABSORBING AND GAS ABSORBING MOLDED ARTICLE**

[調湿・吸ガス性成形品]

Hisao Kishimoto & Eiji Isojima

UNITED STATES PATENT AND TRADEMARK OFFICE  
Washington, D.C. 05/2003

Translated by: Schreiber Translations, Inc.



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1996 (1996) August 27

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1996 (1996) August 27

(54) [Title of Invention]

**MOISTURE ABSORBING AND GAS ABSORBING MOLDED ARTICLE**

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C08L101/00

[FI]

C08K 3/30 kA G

B01D 53/14 A

C08K 3/22 kA E

C08L101/00

[Number of Claims]

[Form of Application]

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Not requested

(21) [Application Number]

Japan Patent Application Hei 7 - 26874

(22) [Application Date]

1995 (1995) February 15

(71) [Applicant]

[Identification Number]

520

[Name]

**FUJI PHOTO FILM CO. LTD. (DB 69-053-6693)**

[Address]

Kanagawa Prefecture, Minami Ashigara City, Nakanuma 210

(71) [Applicant]

[Identification Number]

59119272

[Name]

**SASAKI KAGAKU YAKUHHN KK**

[Address]

Kyoto Prefecture, Kyoto City, Yamashina-ku, Kajuuji Nishikita, Demachi 10-1

(72) [Inventor]

[Name]

Kishimoto, Hisao

[Address]

Kanagawa Prefecture, Minami Ashigara City, Nakanuma 2-10 Fuji Photo Film Co. Ltd. (DB 69-053-6693)

(72) [Inventor]

[Name]

Isojima, Eiji

[Address]

Kyoto Prefecture, Kyoto City, Yamashina-ku, Kajuuji Nishikita, Demachi 10, Sasaki Kagaku Yakuhin KK

(74) [Attorney(s) Representing All Applicants]

[Patent Attorney]

[Name]

Hagino, Hitoshi (3 others)

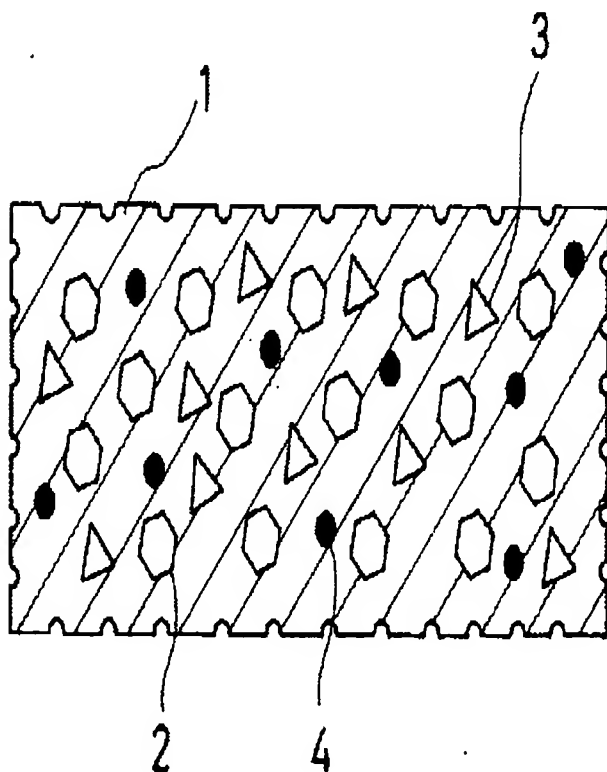
(57) [Abstract]

[Objective]

The invention provides a moisture absorbing and gas absorbing molded article which can prevent deterioration in the quality of various types of articles from moisture absorption or gas absorption when stored over long periods of time, and further, which can maintain the quality and function of said articles safely and effectively.

[Constitution]

The invention is a moisture absorbing and gas absorbing molded article obtained by kneading thermoplastic resin with a moisture absorbing agent (magnesium sulfate) and a gas absorbing agent and forming said article thereof.



[Claim(s)]

[Claim 1]

A moisture absorbing and gas absorbing molded article which is characterized in that it is obtained by kneading and forming a thermoplastic resin with a moisture absorbing magnesium sulfate which is represented by the  $\text{MgSO}_4 \cdot n\text{H}_2\text{O}$  (where  $0 \leq n \leq 3$ ) and which has a mean particle diameter of 1 – 30  $\mu\text{m}$  with a gas absorbing composition which contains  $\text{MgO}$  and  $\text{Al}_2\text{O}_3$ .

[Claim 2]

A moisture absorbing and gas absorbing molded article for storing recording materials with a polymer supporting body as their substrate which is characterized in that it is obtained by kneading and forming a thermoplastic resin with a moisture absorbing magnesium sulfate which is represented by the  $\text{MgSO}_4 \cdot n\text{H}_2\text{O}$  (where  $0 \leq n \leq 3$ ) and which has a mean particle diameter of 1 – 30  $\mu\text{m}$  with a gas absorbing composition which contains  $\text{MgO}$  and  $\text{Al}_2\text{O}_3$ .

[Claim 3]

The moisture absorbing and gas absorbing molded article according to Claim 1 or 2 which is further characterized in that possesses the capacity to absorb acetic acid gas.

[Claim 4]

The moisture absorbing and gas absorbing molded article according to Claim 1 or 2 which is further characterized in that possesses an indicator functions which indicates the level of absorbed moisture or absorbed gas.

[Description of the Invention]

[0001]

[Field of Industrial Application]

As for this invention, it prevents deterioration of quality in various product or other retaining with moisture absorbing and gas absorbing molded article, especially absorbed moisture and gas absorbing over long period it to be possible, furthermore quality, function of said product safety and it regards storable moisture absorbing and gas absorbing molded article effectively.

[0002]

[Prior Art]

Until recently, prevents product or other degradation of quality with such as oxidation which originates in absorbed moisture in foodstuff, drug, electronic part, precision machinery, recording material (photograph impression agent, magnetic material, etc.) or other all field with objective which, silica gel, calcium chloride, quick lime, zeolite or other drying agent and calcium chloride or other deliquescence drying agent are used.

Are packed with particulate, or powder form by paper, non-woven fabrics, or etc., these drying agent in above-mentioned application or with state which is enclosed in container, etc., with product are thrown to wrapping material and are used.

Absorbed moisture effect and absorbed moisture velocity which because of that, drying agent originally has and is superior decreased, with packaging material breakage, deposit of the drying agent to product and mixture or other problem occurred.

In addition, with absorbed moisture liquefaction phenomena also adverse effect, etc., has become problem at time of use of calcium chloride or other deliquescence drying agent.

It is solved by using those to which this problem uses thermoplastic resin sheet in the sandwich includes non-woven fabric and drying agent processes as packaging material of the drying agent, but these in each case are connected to cost increase or other problem.

[0003]

In addition, it possesses high absorbed moisture power and water retention in Japan Unexamined Patent Publication Hei 3 109917 disclosure by kneading drying agent of one kind or more which is selected from magnesium sulfate, aluminum oxide, barium oxide and silicon oxide which in thermoplastic resin are displayed with type  $\text{MgSO}_4 \cdot n\text{H}_2\text{O}$  (where  $0 \leq n \leq 3$ ), furthermore drying agent molded article which does not cause liquid leak or other deficiency with scattering characteristics, hygroscopic, deliquescence is acquired has disclosed.

In Japan Unexamined Patent Publication Hei 5 - 39379 disclosure, in thermoplastic resin it is displayed with type  $\text{MgSO}_4 \cdot n\text{H}_2\text{O}$  (where  $0 \leq n \leq 3$ ), when moisture absorbing characteristics molded article which can keep humidity in fixed humidity by using moisture absorbing characteristics composition which combines magnesium sulfate where average particle diameter is 30  $\mu\text{m}$  or less, is acquired it has disclosed.

These drying agent molded article are with foodstuffs, drugs, cosmetics, luxury articles, precision machinery, mechanical part equal width wide field effective ones as drying agent or hygroscopic wrapping material for quality protection.

[0004]

[Problems to be Solved by the Invention]

But, as for these inventors furthermore as for result of advancing research, with above-mentioned technology it is a unsatisfactory still, understood.

As for aforementioned technology being something which relates to the "drying agent", being something which designate only absorbed moisture power and that it raises water retention as objective mainly, in retention of the above-mentioned product with absorbed moisture power and just water retention problem which cannot be solved exists discovered.

With namely, conventional absorbed moisture there is further deterioration with such as gas which occurs from gas, product itself which deterioration furthermore, invades from outside, it was ascertained.

Especially, when long term storage it does recording material which designates the photographic photosensitive material, magnetic material or other polymer support as substrate, quality deteriorated with gas or other toxic gas which with remains of organic solvent at time of acetic acid gas, production which originates in absorbed moisture of acetate film which is a substrate invades from the solvent gas, or outside introduced odor.

Especially, in case of recording material, deterioration receives direct influence to information recording efficiency with this gas, becomes fatal defect.

[0005]

Until recently, as for retention of this recording material, a incomplete method depolarize and only it was, it leaves deterioration of quality in minimum, by doing sealing up retention, cold, dark place retention and low temperature storage etc.

There is a method which uses molecular sieve of Kodak supplied, but method which uses this molecular sieve is rapid effectiveness, but there was a problem that is not retention.

This way, absorbed moisture furthermore there was not a effective deterioration prevention expedient of deterioration with gas absorbing at time of retaining said recording material or other product, in long term storage.

[0006]

Therefore, as for objective according to the invention, it prevents with absorbed moisture and gas absorbing in retaining deterioration of the quality of various product over long period it to be possible, furthermore quality, function of said product safety and it is effectively to offer storable moisture absorbing and gas absorbing molded article.

[0007]

[Means to Solve the Problems]

It is something to which these inventors can achieve above-mentioned objective result of diligent investigation, with specific moisture absorbing characteristics substance and kneading the specific gas absorbing substance in thermoplastic resin, to discover, completes this invention.

Namely this invention is below-mentioned constitution.

It is displayed (1) thermoplastic resin, with  $\text{MgSO}_4 \cdot n\text{H}_2\text{O}$  (where  $0 \leq n \leq 3$ ) of moisture absorbing characteristics, with the gas absorbing composition which contains magnesium sulfate and  $\text{MgO}$  and  $\text{Al}_2\text{O}_3$  where average particle diameter is 1 - 30  $\mu\text{m}$  the kneading forming, it is acquired moisture absorbing and gas absorbing molded article which is made feature.

It is displayed (2) thermoplastic resin, with  $\text{MgSO}_4 \cdot n\text{H}_2\text{O}$  (where  $0 \leq n \leq 3$ ) of moisture absorbing characteristics, with the gas absorbing composition which contains magnesium sulfate and  $\text{MgO}$  and  $\text{Al}_2\text{O}_3$  where average particle diameter is 1 - 30  $\mu\text{m}$  the kneading forming, it is acquired moisture absorbing and gas absorbing molded article for retention of recording material which designates the polymer support which is made feature as substrate .

Moisture absorbing and gas absorbing molded article which is stated in above-mentioned (1) or (2) which possesses capacity which absorbs (3) acetic acid gas and makes feature.

Moisture absorbing and gas absorbing molded article which is stated in above-mentioned (1) or (2) which degree of (4) absorbed moisture or possesses indicator function which shows degree of gas absorbing and makes feature.

[0008]

[Working Principle]

Moisture absorbing and gas absorbing molded article according to the invention is displayed with  $\text{MgSO}_4 \cdot n\text{H}_2\text{O}$  (where  $0 \leq n \leq 3$ ) of thermoplastic resin, moisture absorbing characteristics, because magnesium sulfate where the average particle diameter is 1 - 30  $\mu\text{m}$  (even moisture absorbing agent you say) and gas absorbing composition (Even gas absorbing agent you say) which contains  $\text{MgO}$  and  $\text{Al}_2\text{O}_3$  the kneading it forms, not only possessing moisture absorbing characteristics, possesses gas absorbing.

Because of this, with absorbed moisture with deterioration of product can be prevented with toxic gas.

Furthermore, aforementioned moisture absorbing agent and gas absorbing agent are surrounded with thermoplastic resin, because contact area of moisture and the gas is restricted, do not react suddenly, reaction advances leniently due to fact that gradually water vapor and gas enter into internal of molded article, moisture absorbing and gas absorbing capacity the persistent does as a result over long period, shows so-called delayed effectiveness.

In addition, this performance long-term maintenance is done with open system, there is not an urgent decrease of capacity with container which it is possible, has taking in and out.

[0009]

Especially, at time of retaining recording material which designates the photograph sensitive material, magnetic material or other polymer support as substrate, because deterioration of material happens gradually with absorbed moisture, and gas

over long period, moisture absorbing, gas absorbing capacity which is stabilized over long period being necessary, sudden reaction is not desirable partly due to fact that rather deterioration is promoted.

Therefore, molded article according to the invention is used for ideal for especially recording material.

Furthermore, molded article according to the invention is suitable, because alkaline gas absorbing agent is used, acidic gas adsorption or in order the trapping to do.

Therefore, in case of recording material which uses TAC or other acetate film for support, molded article according to the invention while retaining is ideal in order to absorb the acetic acid gas with absorbed moisture which occurs.

[0010]

Because to take in moisture absorbing agent which is used for this invention, inside the molecular structure of itself it is stabilized with moisture which absorbed moisture is done as water of crystallization, because moisture which absorbed moisture is done does not exist as liquid, it dries molded article itself, there is not either occurrence of water drop.

Furthermore, assuming, that molded article according to the invention was cut off, there is not outflow of moisture.

Therefore, it glues with moisture of surface of molded article, there is not color change and occurrence, etc., of mold.

In addition, in molded article according to the invention, by fact that indicator function which shows degree of absorbed moisture or degree of gas absorbing can be given, exchange time is suggested to be possible, compared to retention of product becomes possible in stable.

Humidity moisture absorbing is done in 30 - 40% RH, by using molded article according to the invention, it is possible, b fact that at same time corrosiveness toxic gas is absorbed, it can prevent occurrence of occurrence and rust and corrosion o mold (Furthermore, mold propagates generally with humidity of 60% RH or greater).

In addition, embedding doing moisture absorbing agent and gas absorbing agent in thermoplastic resin internal, because moisture absorbing agent and gas absorbing agent of the powder scatter it does not do, said chemical depositing in produc you do not pollute, maintain clean state it is possible.

In addition, because as for molded article according to the invention, there is not a absorbing water heat emission property there are not either times when adverse effect is given to product with heat emission.

[0011]

Especially it cannot be limited as thermoplastic resin in this invention, can use those of public knowledge, but for example polyethylene (PE), polypropylene (PP), polycarbonate (PC), the polyacetal (polyoxymethylene POM), polyterephthalic acid butylene (PBT), polyterephthalic acid ethylene (PET), polyphenylene oxide (PPO), polyamide (PA), the ethylene-vinyl acetate copolymer (EVA), ethylene-methacrylate copolymer, polyvinyl chloride (PVC), polystyrene (PS), acrylonitrile-butadiene-styrene copolymer (ABS), acrylonitrile-styrene copolymer (AS), listing polyester, polyacrylate ester, poly vinylidene chloride (PVDC), etc., one, two or more kinds among these can be used.

In description above, with preferably polyethylene resin, it is a more preferably, low density polyethylene resin (as for example density,  $0.910 - 0.930 \text{ g/cm}^3$ ).

Transmission of moisture, gas for molded article by using this, being the appropriateness, it possesses more satisfactory moisture absorbing characteristics, gas absorbing, it reaches point where at same time also retention of satisfactory effect has.

[0012]

Regarding to this invention, with thermoplastic resin average particle diameter of moisture absorbing agent which is used,



with 1 - 30  $\mu\text{m}$ , is preferably 2 - 15  $\mu\text{m}$ .

[0013]

Regarding to this invention, with thermoplastic resin preferably 5 - 400 parts by weight, more preferably 10 - 50 parts by weight combining moisture absorbing agent with respect to thermoplastic resin 100 parts by weight, it uses moisture absorbing agent which is used.

Moisture absorbing agent which is used with this invention as it possesses moisture absorbing characteristics which excel has had dispersibility which is superior with respect to thermoplastic resin.

Here, moisture absorbing characteristics, while possessing satisfactory absorbed moisture power and water retention, is the performance which can maintain low humidity which it sets beforehand.

[0014]

In addition, if it is a composition which contains  $\text{MgO}$  and  $\text{Al}_2\text{O}_3$  with thermoplastic resin and moisture absorbing agent a gas absorbing agent which is used, it is good any ones.

As gas absorbing agent, 32.3 wt% - 42.6 weight% including  $\text{MgO}$ , it is a composition where those which  $\text{Al}_2\text{O}_3$  13.6 weight% - 18.0 weight% are included are desirable, are shown with more preferably 6  $\text{MgO} * \text{Al}_2\text{O}_3 * \text{CO}_2 * n\text{H}_2\text{O}$  ( $10 \leq n \leq 20$ ).

It is a range of preferably  $13 \leq n \leq 15$  here as  $n$ .

As gas absorbing agent, concretely, Tomix AD-500 (Tomita Pharmaceutical Co. Ltd. make), etc., can be listed.

Preferably 1 - 100 parts by weight, more preferably 5 - 50 parts by weight combining said gas absorbing agent with respect to the thermoplastic resin 100 parts by weight, it uses gas absorbing agent.

Gas absorbing agent which is used for this invention as it possesses gas absorbing which excels, has had dispersibility which is superior with respect to thermoplastic resin.

Here, gas absorbing, gas which invades from various gas, and outside which occur from various product is absorbed, performance which trapping it is possible is.

Here, molded article according to the invention absorbs, as gas which trapping when it is a acetic acid gas, ammonia, hydrogen sulfide, sulfurous acid, hydrogen chloride, acetaldehyde or other toxic gas, this invention it is possible, especially acidic gas is done adsorption or trapping, is possible, can neutralize acidic gas which is taken in with absorbance of alkaline.

In addition, in case according to the invention, as gas which possesses the trimethylamine or other bad odor can be absorbed, it possesses also deodorizing effect.

[0015]

As for aforementioned gas absorbing agent, it is desirable to make average particle diameter 1 - 50  $\mu\text{m}$ , at time of each use it is a more preferably 2  $\mu\text{m}$  - 15  $\mu\text{m}$ .

Because of this, kneading in thermoplastic resin, it becomes easy, furthermore gas absorbing performance becomes proper.

Moisture absorbing agent and gas absorbing agent making use of those of the same average particle diameter are good, in addition each those of particle diameter which differs use, mix are possible to use.

[0016]

Regarding to this invention, ratio of starting material which it kneads especially is not limited. It selects appropriately according to storage site and temperature, humidity, airtightness and unsealed, storage time or other storage condition of product it is desirable.

Said ratio, it is desirable, to combine aforementioned moisture absorbing agent 5 - 400 parts by weight, gas absorbing agent 1 - 100 parts by weight usually, with respect to thermoplastic resin 100 parts by weight, furthermore, combining moisture absorbing agent 10 - 50 parts by weight, gas absorbing agent 5 - 50 parts by weight, it uses, is more desirable.

When ratio of moisture absorbing agent and gas absorbing agent is aforementioned range, it possesses furthermore it can acquire, a higher moisture absorbing characteristics and gas absorbing, those which are superior in formation suitability.

[0017]

Concretely, absorbed moisture it is possible to same weight as moisture absorbing agent which is included in molded article by making above-mentioned quantity.

Furthermore, long-term maintenance is possible to humidity 30 - 40RH% as moisture absorbing capacity.

[0018]

Molded article according to the invention degree of absorbed moisture or has indicator function which shows degree of gas absorbing, it is desirable.

When here, indicator function, it absorbs moisture or gas of a certain constant amount, trapping does, color and concentration changing, it is the functional saw which shows endpoint of performance of said molded article.

Responding to for example moisture, it can give endpoint display function with color change, by adding compound which changes in pink whose color of entirety is bright from blue violet, with respect to moisture absorbing and gas absorbing molded article according to the invention it is possible.

You can list method which adds compound which possesses indicator function as method which can give indicator function in molded article, to molded article.

As said compound, composition, etc., which includes anhydride cobalt chloride which is stated in Japan Unexamined Patent Publication Hei 3 - 277659 disclosure can be listed.

[0019]

Addition quantity of compound which possesses indicator function cannot be limited, especially can set appropriately with kind, etc., of the application, storage condition, said compound of said molded article, but it is a preferably 0.2 - 5 parts by weight, more preferably 0.5 - 3 parts by weight with respect to thermoplastic resin 100 parts by weight.

[0020]

As manufacturing method of moisture absorbing and gas absorbing molded article according to the invention, there is not especially restriction, can produce with usually next kind of method.

Aforementioned thermoplastic resin, moisture absorbing agent and gas absorbing agent and other additive, making use of mixing roller or other kneader, molding machine, kneading molding machine, etc., approximately 5 - 40 min kneading with approximately 100 - 350°C, if it should have formed.

[0021]

Molding is possible moisture absorbing and gas absorbing molded article according to the invention which becomes this

way, to shape of film, sheet, plate or pellet with extrusion molding, coextrusion molding, injection molding, hollow molding, extrusion coating formation and crosslinking foam molding, etc.

Regarding to this invention, forms in plate is desirable.

In addition, those which had flexibility are desirable.

Especially, when it uses for recording material which designates polymer support as substrate, by fact that it forms in especially plate, it attaches houses inside same container as said recording material it to be possible, effect according to the invention is acquired effectively.

Furthermore, schematic diagram of cross section structure of those which formed in plate as one embodiment of molded article, is shown in Figure 1.

But, it is not something where content according to the invention is limited in these.

In Figure 1, in internal of thermoplastic resin 1, moisture absorbing agent 2, gas absorbing agent 3, indicator compound 4 is done, each kneading because of this becomes satisfactory moisture absorbing characteristics, gas absorbing and way which possesses the retention of property.

[0022]

If molded article according to the invention is product which has necessity to prevent deterioration of product with absorbed moisture, gas absorption which covers the long period, you can use for each ones.

For example foodstuffs, drugs, electronic parts, precision machinery, recording material (photographic photosensitive material, magnetic material, etc.), etc., can be listed.

As though it is an earlier description, you can use molded article of the this invention, for recording material (photographic photosensitive material, magnetic material, etc.) desirably.

Recording material, with thing of recording material which designates polymer support as the substrate, for example silver halide photosensitive material or other photographic photosensitive material and audio tape, video tape, floppy disk or other magnetic recording material can be listed here.

Especially, you can use for long term storage of recording material which possesses the TAC or other acetate film desirably.

[0023]

As method of use of molded article according to the invention, with product it is possible to container or packaging material for housing product which is a retention object, to house and, molded article itself according to the invention may become container, or packaging material.

In addition, with molded article according to the invention it is desirable at time of use of molded article according to the invention, with moisture content of recording material or other retention object product as 40% or less, to seal up.

If you use under this kind of condition, lifetime is semipermanent.

But, if said molded article and retention object product it not to be necessary to seal up completely, completely outside putting out even when, the climate of Japan at least be able to use, not sealing up completely in practical, you can use 1 year over several years.

[0024]

Next it shows criterion of use range of molded article (volume: 10 cm<sup>3</sup> of one layer) according to the invention, with

below-mentioned recording material as one example.

(a) Completely sealed system (5 years or more): number of layers of formed article according to the invention / volume of recording material						
35 mm roll film			2 layers / 305 m (1000 ft)	f	t	)
16 mm roll film			one layer / 305 m (1000 ft)	f	t	)
1/2 in tape			one layer / T - 120 x 1 0 rolls			
Cabinet size film			one layer / 100 sheets			
5 in floppy disk			one layer / 100 disks			
CD disk			one layer / 100 disks			

[0025]

(b) Partially open system (approximately 2 years)						
35 mm roll film			3 layers / 305 m (1000 ft)		t	)
16 mm roll film			one layer / 152m (500 ft)	t	)	
1/2 in tape			one layer / T - 120 x 3 - 5 rolls			
Cabinet size film			one layer / 25 - 50 sheets			
5 in floppy disk			one layer / 25 - 50 disks			
CD disk			one layer / 25 - 50 disks			

[0026]

Furthermore, when it is a film whose occurrence of gas is already considerable, you avoid perfection sealing up, it is desirable.

As front preparation of retention of recording material, as film of the or other rolled state for movie it winds film cleaning machine or through there-water washing machine and changes, when moisture absorbing and gas absorbing molded article is inserted after redrying, acting effect of the this invention increases more.

In addition, with this invention in case of recording material which designates the TAC support as substrate, as not contained iron ion which promotes the degradation of TAC, material is selected is desirable.

[0027]

[Working Example(s)]

Below Working Example is shown, content according to the invention is explained concretely, but it is not something where content according to the invention is limited in these.

Working Example 1

low density polyethylene (Sumitomo Chemical Co. Ltd. (DB 69-053-5307) make Sumikathene G-806 density 0.917 g/cm in 100 parts by weight, 30 parts by weight, and Tomita Pharmaceutical Co. Ltd. make Tomix AD-500 (Umbrella 23

ml/10g of aluminum oxide 17.15 weight%, magnesium oxide 37.24 weight%, carbon dioxide 8.10 weight%, weight reduction on drying 5.3 2 wt%, apparent) after kneading 10 parts by weight with kneading extrusion molding machine (KK Ikegai make PCM 45 twin screw extruder), granulating doing Mg SO<sub>4</sub> of the average particle diameter 4.59 μm with hot cut, it produced pellet.

Next, moisture absorbing and gas absorbing plate of 85 mm X 54 mm X 1.5 mm was produced this pellet making use of injection molding machine (Nissei Plastic Industrial Co. Ltd. (DB 69-060-7098) make PS-20E2VSE).

With this plate 2 as sample, you inserted in glass container of space volume 900 cm<sup>3</sup>.

To insert 90% acetic acid into dessicator separately from that, after the standing doing with 25°C, recovering, it introduce gas of 50 cm<sup>3</sup> inside said dessicator into aforementioned glass container, adjusted the concentration of acetic acid gas.

Here, acetic acid gas concentration, and humidity inside glass container immediately after introducing said gas were each acetic acid gas concentration 22 ppm、 humidity 100%RH (25°C).

[0028]

This was retained in 25°C, after predetermined time (Table 1 reference) elapsing, concentration and humidity of acetic acid gas which has remained inside container making use of Kitagawa type gas detector were measured, gas absorbing, moisture absorbing characteristics evaluation was done.

Furthermore, setting of acetic acid gas concentration of initial stage is acetic acid gas concentration inside the general-purpose container which is formed with hydrolysis of acetate film.

Result is shown in Table 1, and Figure 2、 3.

[0029]

[Table 1]

表-1 容器内の相対湿度と酢酸ガス濃度の変動

時間	酢酸ガス濃度	相対湿度
開始時	2.2 ppm	RH100%
1時間	0.7 ppm	————
3時間	0.6 ppm	————
7時間	0.5 ppm	————
12時間	————	RH30.5%
1日	0.33 ppm	RH29.6%
2日	————	RH26.6%
3日	————	RH24.8%
4日	0.23 ppm	RH23.2%
5日	————	RH22.3%
6日	0.14 ppm	RH21.4%
7日	————	RH21.7%
8日	————	RH21.3%
9日	————	RH21.6%
11日	————	RH22.2%
13日	N. D.	RH21.8%

[Table 1; Translation]

Table 1 Variation in relative humidity and acetic acid gas absorption in a vessel

Time	Acetic acid gas level	Relative humidity
Start		
1 hour		
3 hours		
7 hours		
12 hours		
1 day		
2 days		
3 days		
4 days		
5 days		
6 days		
7 days		
8 days		
9 days		
10 days		
11 days		
12 days		

[0030]

From these results, as for sample according to the invention, as shown in the Table 1 and Figure 2, be able to absorb to level which cannot detect acetic acid gas at least in 13th day, as furthermore shown in the Table 1 and Figure 3, moisture absorbed into effective, After 6th day being able to keep humidity it is uniformly in approximately 21% vicinity, understands.

[0031]

#### Working Example 2

It throws moisture absorbing and gas absorbing plate 2 which is used in Working Example 1, to glass container of 900 ml manufactures inside container in RH100%, it seals up container with temperature and humidity data accumulation equipment TRH-DM 2 and silicon plug which mounts temperature and humidity sensor flat type THP-13 (God Sakae Ltd make).

And, humidity inside container is measured in time wise.

With time point where fluctuation of measured data stops being almost, it manufactures inside container again in RH100% does absorbed moisture.

This kind of operation repeatedly was done.

On one hand, after sealing up container which is similar to description above with silicon plug, acetic acid gas concentration inside container was manufactured in 20 ppm, after that measurement mouth which is installed in plug was opened, with gas detection tube (Ltd. GasTech make) gas concentration was measured in time wise.

Until gas concentration inside container becomes N.D., it measures, after that it introduced acetic acid gas again, manufactured in 20 ppm, repeatedly it did operation again of doing gas absorbing.

As description above, each moisture absorbing characteristics test, gas absorbing test was done, this operation long period was repeated.

Those results, gas absorbing in Figure 4, showed moisture absorbing characteristics in Figure 5.



From result of Figure 4, Figure 5, sample according to the invention, absorbency of the acetic acid gas and moisture is superior, at same time that does long period persistent, understands.

[0032]

#### Working Example 3

35 mm film 400 feet for movie of moisture content 36.0g/1000 feet and moisture absorbing and gas absorbing plate 1.5 of 85 mm X 54 mm X 1.5 mm which are acquired with the Working Example 1, was inserted in sack (380 mm X 180 mm X 40  $\mu$ m) of low density polyethylene make, this sack furthermore was inserted in film storage can (Diameter 180 mm height 40 mm) for common movie.

And, main body of retention can and seam of cover with vinyl tape in each case of state of state and uncapped chain which capped chain are done, it measured temporal variation of humidity inside the retention can in 25°C, temperature and humidity data recording equipment TRH-DM 2 (Shinyei Kaisha make) and making use of temperature and humidity sensor flat type THP-13 (Shinyei Kaisha make).

Furthermore, setting position of temperature and humidity sensor made inside of retention tube with inside of low density polyethylene make sack and outside of polyethylene bag.

In addition, stored state, of nowadays concretely, film for the movie was inserted in inside of commercial polyethylene bag as Comparative Example, while it was a open state thing (You call blank) which was inserted in metallic can was execute description above and under identical condition.

sensor setting position of blank made inside of polyethylene bag and outside of polyethylene bag.  
Result was shown in Table 2 and Figure 6, Figure 7.

[0033]

[Table 2]

表-2

日数	ポリエチレン製袋内の相対湿度			ポリエチレン製袋外の相対湿度		
	密封状態	未密封状態	ブランク	密封状態	未密封状態	ブランク
S	RH 43.1%	RH 42.9%	RH 43.0%	RH 55.4%	RH 40.1%	RH 39.9%
1日	RH 30.1%	RH 36.2%	RH 43.2%	RH 30.8%	RH 54.9%	RH 58.1%
3日	RH 30.2%	RH 36.5%	RH 43.7%	RH 30.5%	RH 57.2%	RH 59.5%
5日	RH 29.8%	RH 36.8%	RH 43.8%	RH 30.4%	RH 58.0%	RH 60.1%
7日	RH 30.2%	RH 37.1%	RH 43.8%	RH 30.8%	RH 58.3%	RH 60.4%
9日	RH 29.9%	RH 37.5%	RH 44.1%	RH 30.9%	RH 58.9%	RH 61.2%
13日	RH 30.2%	RH 38.5%	RH 45.3%	RH 31.1%	RH 59.8%	RH 61.8%
16日	RH 30.5%	RH 39.6%	RH 46.5%	RH 30.8%	RH 60.1%	RH 62.1%
19日	RH 30.4%	RH 40.1%	RH 46.4%	RH 31.5%	RH 60.1%	RH 63.1%
22日	RH 30.7%	RH 40.4%	RH 47.6%	RH 31.1%	RH 59.8%	RH 63.0%
26日	RH 30.6%	RH 40.6%	RH 48.6%	RH 31.5%	RH 60.3%	RH 62.8%
30日	RH 30.9%	RH 41.2%	RH 49.8%	RH 31.8%	RH 63.1%	RH 67.2%
34日	RH 31.1%	RH 41.8%	RH 50.2%	RH 32.5%	RH 62.5%	RH 65.4%
38日	RH 31.4%	RH 42.3%	RH 50.6%	RH 33.0%	RH 62.3%	RH 65.2%
42日	RH 31.4%	RH 42.5%	RH 51.2%	RH 33.2%	RH 63.1%	RH 66.7%

[Table 2; Translation]

Days	Relative humidity inside polyethylene bag			Relative humidity outside polyethylene bag		
	Tightly sealed	Unsealed	Blank	Tightly sealed	Unsealed	Blank
1 day						
3 days						
5 days						
9 days						
13 days						
16 days						
19 days						
22 days						
26 days						
30 days						
34 days						
38 days						
42 days						

[0034]

From result of Table 2 and Figure 6, in inside polyethylene bag, sample according to the invention is kept being a place where relative humidity is low in comparison with blank which is a conventional state, regardless of not yet sealing up and sealing up, understands.

Therefore, not having sealed up also, when it uses sample of the this invention, you can keep in low humidity state.

Furthermore, it is a storable with humidity where sealed state is lower in comparison with not yet sealing up, understands.

On one hand, if it has made sealed state from result of Table 2 and the Figure 7, in outside polyethylene bag, even outside said sack, can keep the sample according to the invention, understands in low humidity state.

From these results, sample according to the invention with capped chain state and absorbs moisture with uncapped chain state, can retain contents understands in effective.

In addition, when capped chain state and uncapped chain state are compared, from capped chain state it can retain you understand in long term.

[0035]

#### Working Example 4

moisture absorbing and gas absorbing plate which is produced with Working Example 1, lengthy standing was done in each atmosphere of humidity 50% RH and 75% RH.

moisture absorption of said plate of that time, was shown with amount of weight increase (weight%) of said plate.

moisture absorption change over time was as shown in Figure 8.

Because of this, absorbed moisture power (absorbed moisture velocity, absorbed moisture endpoint) of said plate understands.

[0036]

[Effects of the Invention]

With moisture absorbing and gas absorbing molded article of the this invention, it prevents with absorbed moisture and gas absorbing in retaining deterioration of quality of various product over long period it to be possible, furthermore quality, function of said product it becomes storable safely and effectively.

[Brief Explanation of the Drawing(s)]

[Figure 1]

It is a schematic diagram which shows cross section structure of one example of moisture absorbing and gas absorbing molded article according to the invention.

[Figure 2]

It is a graph which shows result of change over time of acetic acid gas absorption of the moisture absorbing and gas absorbing molded article according to the invention.

[Figure 3]

It is a graph which shows result of moisture absorption change over time of moisture absorbing and gas absorbing molded article according to the invention.

[Figure 4]

It is a graph which shows result of repetition acetic acid gas absorption test of moisture absorbing and gas absorbing agent plate according to the invention.

[Figure 5]

It is a graph which shows result of repetition absorbed moisture test of the moisture absorbing and gas absorbing agent plate according to the invention.

[Figure 6]

It is a graph which shows absorbed moisture characteristic inside polyethylene bag of moisture absorbing and gas absorbing molded article according to the invention.

[Figure 7]

It is a graph which shows absorbed moisture characteristic outside polyethylene bag of moisture absorbing and gas absorbing molded article according to the invention.

[Figure 8]

It is a graph which shows moisture absorption change over time of moisture absorbing and gas absorbing molded article according to the invention.

[Explanation of Symbols in Drawings]

thermoplastic resin

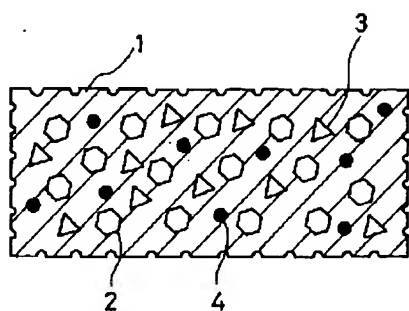
moisture absorbing agent

gas absorbing agent

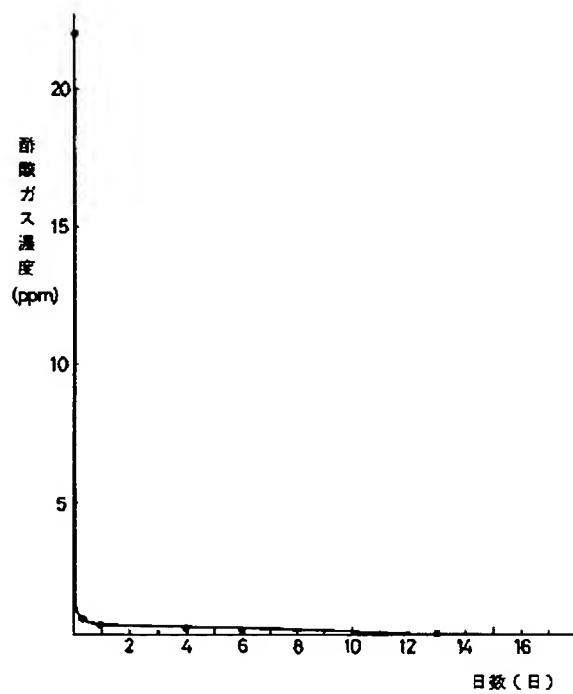
indicator compound

## Drawings

[Figure 1]



[Figure 2]

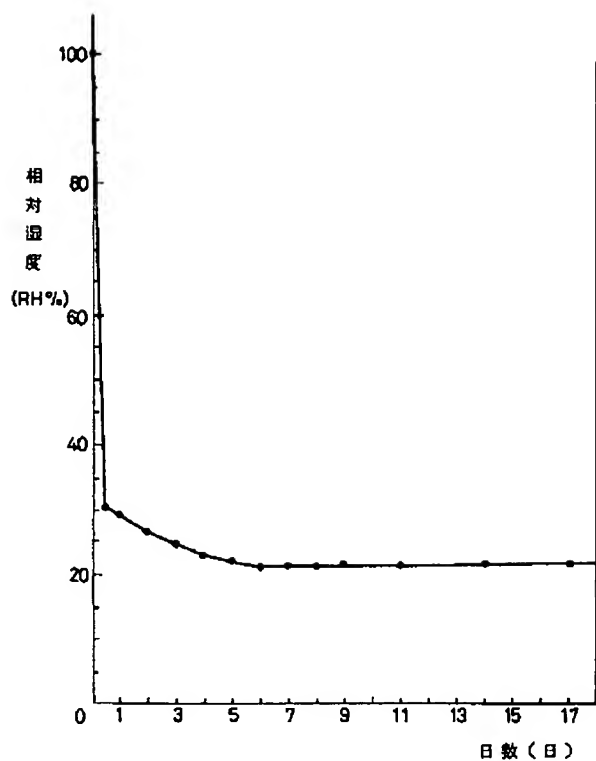


[Figure 2; Translation]

Y-axis: Acetic acid gas concentration (ppm)

X-axis: Days (day)

[Figure 3]

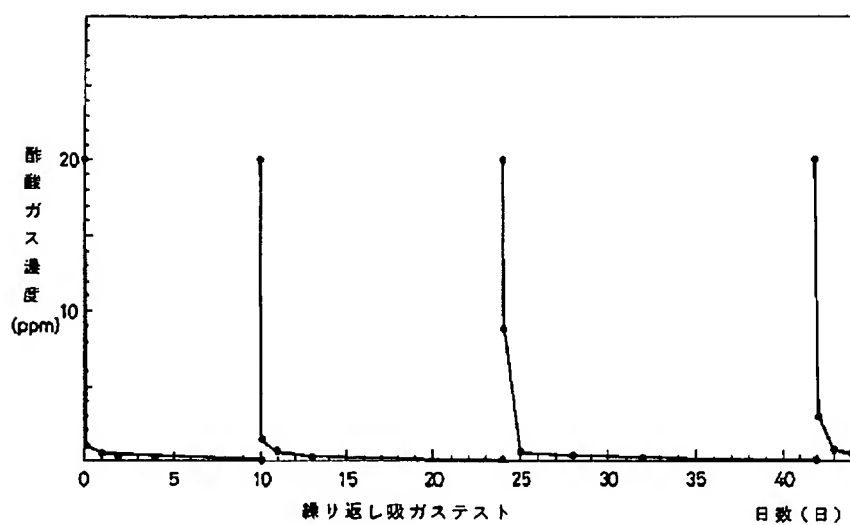


[Figure 3; Translation]

Y-axis; Relative humidity (% RH)

X-axis Days (day)

[Figure 4]

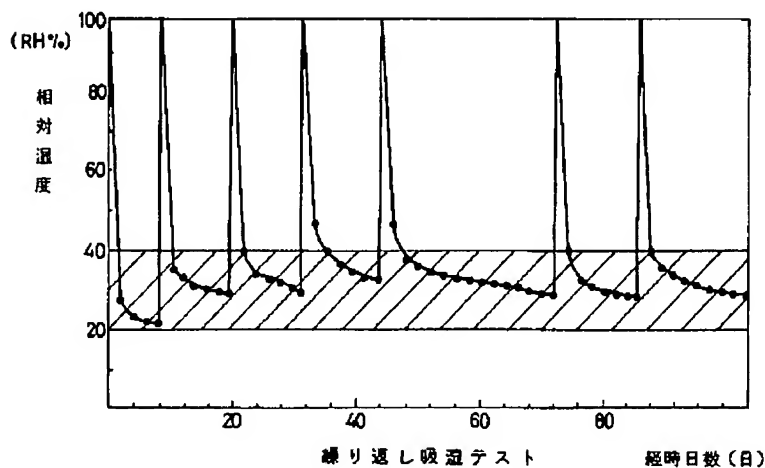


[Figure 4; Translation]

Y-axis; Acetic acid gas concentration (ppm)

X-axis; Repetitive absorbed gas test      Days (day)

[Figure 5]

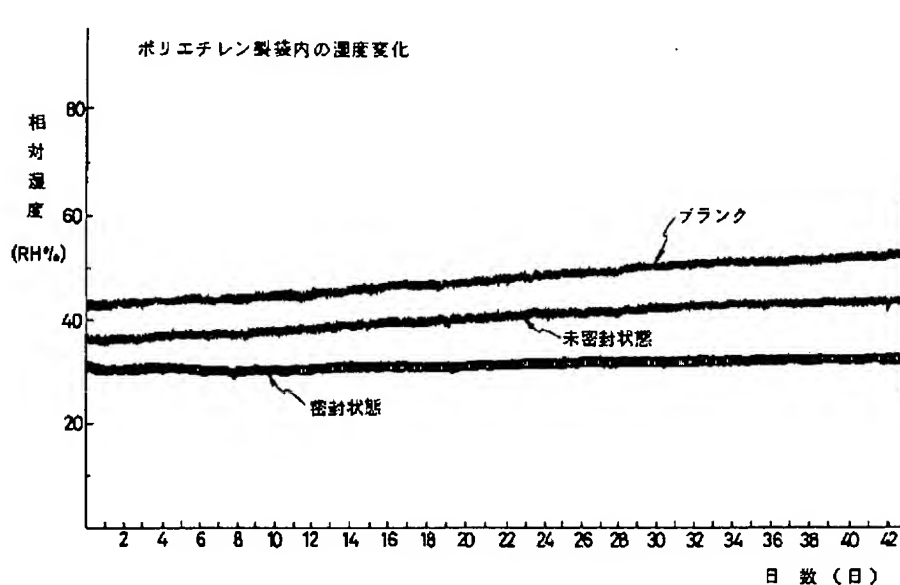


[Figure 5; Translation]

Y-axis; Relative humidity

X-axis; Repetitive absorbed moisture test      Elapsed time (days)

[Figure 6]



[Figure 6; Translation]

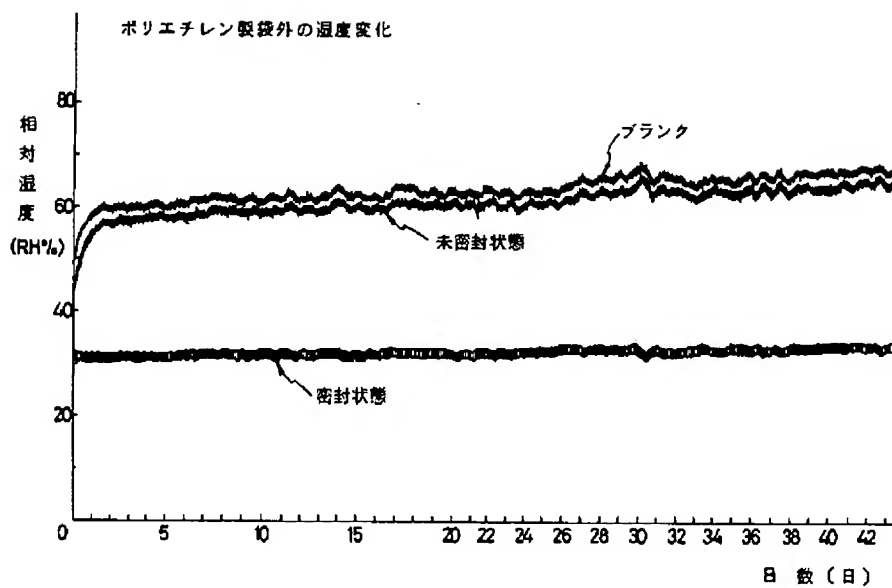
Moisture variation inside a polyethylene bag

Y-axis; Relative humidity (% RH)

Blank  
Unsealed  
Sealed

X-axis; Days (day)

[Figure 7]



[Figure 7; Translation]

Moisture variation inside a polyethylene bag

Y-axis; Relative humidity (% RH)

Blank  
Unsealed  
Sealed

X-axis; Days (day)